

WHAT IS CLAIMED IS:

1. A tube type pumping apparatus comprising:
 - a wall;
 - a resilient tube, provided along said wall having an internal hollow space to be used as a passage; and
 - a squeezing member arranged in such a manner that said resilient tube is sandwiched between said squeezing member and said wall such that said resilient tube is squeezed as said squeezing member moves along said wall, thereby transporting liquid through said resilient tube;wherein said tube type pumping apparatus further comprises:
 - a squeezing member holder for holding said squeezing member in such a manner that said squeezing member could change its position between a squeezing position near said wall and an initial position away from said wall;
 - a cam member whose surface receives a driving force from a driving source to change positions of said squeezing member between said squeezing position near said wall and said initial position away from said wall;
 - an engagement mechanism, which causes said squeezing member holder and said cam member to move in a corresponding manner after a given idle time elapses as said cam member begins to move; and
 - a regulating force generator that provides a regulating force to said squeezing member holder at an interval as said squeezing member moves.
2. The tube type pumping apparatus as set forth in Claim 1 wherein said squeezing member includes one or more rollers; said squeezing member holder is a rotary member having a pair of supporting plates for holding said rollers therebetween; and said resilient tube and said wall are arranged around said squeezing member holder.
3. The tube type pumping apparatus as set forth in Claim 2 wherein said regulating force generator is constructed with a regulating projection, which projects toward the outer circumference from said squeezing member holder; and a spring member, which resiliently contacts said regulating projection around said squeezing member holder.

4. The tube type pumping apparatus as set forth in Claim 3 wherein a plurality of said rollers are held by said squeezing member holder at points at a distance along said circumference; said regulating projection being near said points where said roller is supported;

wherein said spring member is arranged, at a point around said squeezing member support in such a manner that said squeezing point is kept away from the region in which said rollers squeeze said resilient tube.

5. The tube type pumping apparatus as set forth in Claim 4 wherein said regulating force generation means generates a force in the direction in which said regulating force generation means pushes any one of said rollers against said resilient tube.

6. A tube type pumping apparatus comprising:

a wall;

a resilient tube, provided along said wall having an internal hollow space to be used as a passage; and

a squeezing member arranged in such a manner that said resilient tube is sandwiched between said squeezing member and said wall such that said resilient tube is squeezed as said squeezing member moves along said wall, thereby transporting liquid through said resilient tube;

wherein said squeezing member has a squeezing surface with a curvature;

said resilient tube being provided with a tube position regulating means for keeping said resilient tube in the center in the width (horizontal) direction of said squeezing surface when said squeezing member squeezes said resilient tube.

7. The tube type pumping apparatus as set forth in Claim 6 wherein said tube position regulating means are arranged at point in the front end and the back end of the forward direction of said squeezing member.

8. The tube type pumping apparatus as set forth in Claim 6 wherein said tube type pumping apparatus further comprises:

a squeezing member holder for holding said squeezing member in such a manner that said squeezing member can change its position between a squeezing position near said wall and an initial position away from said wall; and

a cam member that transmits a driving force generated by a driving source to a cam surface thereby moving said squeezing member to or from said squeezing position and from or to said initial position.

9. The tube type pumping apparatus as set forth in Claim 8 wherein said squeezing member holder has a pair of supporting plates having an elongated hole that is elongated in a radial direction such that the ends of the rotary center axis of said rollers are fitted to said elongated holes;

wherein said resilient tube and said wall are arranged around said pair of supporting plates that are facing each other; projections, which is said tube position regulating means, project from each of the facing surfaces of said pair of supporting plates;

said cam member having a pair of end plates facing each other in such a manner that said pair of end plates sandwich said pair of supporting plates; said end plates having a cam surface formed in such a manner that both ends of said rotary shaft slide on said cam surface; and

an engagement mechanism, provided at a point between said cam member and said squeezing holder to cause said squeezing member holder and said cam member to move in a corresponding manner after a given idle time elapses as cam member begins to move; such that said rollers move along said resilient tube and said wall after said rollers appear from said initial position to said squeezing position.

10. A tube type pumping apparatus comprising:

a resilient tube provided along a wall;

a squeezing member positioned to move along the wall to squeeze the resilient tube against the wall, thereby transporting material contained in the resilient tube;

a squeezing member holder that holds the squeezing member;
a cam member whose surface receives a driving force from a driving source to change positions of the squeezing member between an initial position away from the wall and a squeezing position near the wall; and
a regulating force generator that provides a regulating force to the squeezing member at a transition time interval as the squeezing member moves from the initial position to the squeezing position, the regulating force generator and the cam member acting together to prevent the squeezing member from applying pressure against the resilient tube during the transition time interval.

11. The tube type pumping apparatus as set forth in Claim 10 wherein:
the squeezing member includes one or more rollers;
the squeezing member holder is a rotary member having a pair of supporting plates for holding the rollers therebetween; and
the resilient tube and the wall are arranged around the squeezing member holder.

12. The tube type pumping apparatus as set forth in Claim 11 wherein the regulating force generator includes a regulating projection that projects toward the outer circumference of the squeezing member holder and a spring member that resiliently contacts the regulating projection around the squeezing member holder.

13. The tube type pumping apparatus as set forth in Claim 12 wherein the regulating projection is disposed near a point where the corresponding roller is supported by the squeezing member holder.

14. The tube type pumping apparatus as set forth in Claim 10 wherein the squeezing member includes a roller having a curved squeezing surface.

15. The tube type pumping apparatus as set forth in Claim 10 wherein the squeezing member includes a roller having a curved squeezing surface, the

curved squeezing surface having at its both ends a projected portion to maintain the alignment of the resilient tube with the squeezing surface.